

Algorithm for Optical Microscopy Image Denoising and Restoration

Need for improvements in images used for fluorescent microscopy

Fluorescence microscopy has been a revolutionary driving force for biological research, and the extent of knowledge achievable is primarily determined by the content and quality of the acquired images. However, to date, photon detection remains non-ideal, and the resultant noise produces artifacts and impairs a wide range of fast, low-light, and quantitative imaging discoveries. No physics-based solution has been demonstrated as robust and compatible with all major imaging systems and camera types.

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Innovators at Georgia Tech have developed MIRO, a universal system-aware solution based on local noise correction with broad applicability to current microscopy platforms. Contrary to existing approaches, MIRO is based on a model that considers all pattern, uniform, and non-uniform noise statistics to correct all the microscopy-relevant noise sources to effectively extract biological features from noise. This deterministic methodology represents a significant leap and offers the ultimate general solution to fluorescence microscopy image restoration.

Summary Bullets

- Miro performs consistent noise correction independent of the image sampling rate (working even with sparse images).
- MIRO is compatible with all major imaging systems and camera types.
- Unlike existing approaches, MIRO uses pattern, uniform, and non-uniform noise statistics to correct microscopy-relevant noise sources.

Solution Advantages

- **Robust:** MIRO performs consistent noise correction independent of the image sampling rate (working even with sparse images).
- **Widely compatible:** Compatible with all major imaging systems and camera types.

- **Comprehensive:** Unlike existing approaches, MIRO uses pattern, uniform, and non-uniform noise statistics to correct microscopy-relevant noise sources.

Potential Commercial Applications

- Microscopy and fluorescent microscopy applications
- Applications in the camera industry

Inventors

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IP Status

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Publications

[Optimal Sparsity Allows Reliable System-Aware Restoration of Fluorescence Microscopy Images](#),
ScienceAdvances - August 30, 2023

Images

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<https://s3.sandbox.research.gatech.edu//index.php/print/pdf/node/4154>